respect to a time synchronization offset which can be covered by frame synchronization, as compared to a case in which the integration section is not divided.

According to the method of the present invention as described above, when the calculation quantity of complex multiplication is based in an OFDM system using N sub-carriers, the calculation quantity in the method according to the present invention is proportional to N^2. However, a conventional method using the unit response of a channel requires a calculation quantity which is proportional to

$$N \times \left[N + \frac{N}{2}\log_2 N\right].$$

Hence, the method according to the present invention can reduce the calculation quantity by

$$\frac{N^2}{2}\log_2$$

while being stably performed likewise the conventional method within an offset range of a coarse frame timing algorithm. When the reduced calculation quantity is compared with the calculation quantity in the conventional method, a case using 1024 sub-carriers requires only a calculation quantity corresponding to 1/6 times the calculation quantity of the conventional method, and a case using 2048 sub-carriers requires only a calculation quantity corresponding to 1/11 times that of the conventional method. Also, the reduced calculation quantity is the same as the calculation quantity obtained by removing N IFFT processes. Here, N is the number of sub-carriers.

As described above, in the method and device for estimating a coarse frequency offset in an OFDM receiver, stable frequency synchronization can be performed by a small quantity of calculation.

What is claimed is:

1. A device for estimating a coarse frequency offset, which is included in a frequency offset estimator of an orthogonal frequency division multiplexing (OFDM) receiver, the device comprising:

a buffer for receiving demodulated symbol X(k) and cyclic shifting the symbol X(k) by a predetermined shift amount d and outputting shifted symbol X(k+d);

a reference symbol generator for generating a reference symbol Z(k);

a counter for counting the shift amount of d;

a partial correlation for receiving the shifted symbol X(k+d) and the phase reference symbol Z(k) and calculating a partial correlation value

$$\sum_{m=0}^{K-1}\left|\sum_{k=m(N/K)}^{(m+1)(N/K)-1} X(((k+d)_N)Z^*(k))\right|$$

with respect to K divided bands, wherein a range of shift amount d is between -N/2 and N/2; and

a maximum detector for obtaining a shift amount of d by which the partial correlation value is maximum, and outputting the shift amount of d as an estimated coarse frequency offset value.

2. The device of claim 1, wherein the number of divided bands, K, is set to be within 2 T_{off} when a timing synchronization offset which can be covered by frame synchronization is set to be T_{off}.

3. A method of estimating a coarse frequency offset in an orthogonal frequency division multiplexing (OFDM) receiver which performs OFDM demodulation and frequency synchronization, the method comprising the steps of:

(a) generating a reference symbol Z(k);

(b) counting the shift amount of d;

(c) receiving the shifted symbol X(k+d) and the phase reference symbol Z(k);

(d) calculating a partial correlation value

$$\sum_{m=0}^{K-1}\left|\sum_{k=m(N/K)}^{(m+1)(N/K)-1} X(((k+d)_N)Z^*(k))\right|$$

with respect to K divided bands, wherein

a range of shift amount d is between -N/2 and N/2; and

(e) obtaining a shift amount of d by which the partial correlation value is maximum, and outputting the shift amount of d as an estimated coarse frequency offset value.

4. The device of claim 3, wherein the number of divided bands, K, is set to be within 2 T_{off} when a timing synchronization offset which can be covered by frame synchronization is set to be T_{off}.

5. An orthogonal frequency division multiplexing (OFDM) receiver comprising:

a buffer for receiving demodulated symbol X(k) and cyclic shifting the symbol X(k) by a predetermined shift amount d and outputting shifted symbol X(k+d);

a reference symbol generator for generating a reference symbol Z(k);

a counter for counting the shift amount of d;

a partial correlation for receiving the shifted symbol X(k+d) and the phase reference symbol Z(k) and calculating a partial correlation value

$$\sum_{m=0}^{K-1}\left|\sum_{k=m(N/K)}^{(m+1)(N/K)-1} X(((k+d)_N)Z^*(k))\right|$$

with respect to K divided bands, wherein a range of shift amount d is between -N/2 and N/2; and

a maximum detector for obtaining a shift amount of d by which the partial correlation value is maximum, and outputting the shift amount of d as an estimated coarse frequency offset value.

6. The device of claim 5, wherein the number of divided bands, K, is set to be within 2 T_{off} when a timing synchronization offset which can be covered by frame synchronization is set to be T_{off}.

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